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The Ignored Impact of the Livestock Sector on Climate Change: An Analysis from the Perspective of International Law

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Abstract

Climate change stands as the paramount challenge confronting humanity in the contemporary era. Attempting to address the problem, the main sectors responsible for it have been subject to domestic or international policies and laws aimed at reducing greenhouse gas (GHG) emissions, except one: livestock. Given that animal-sourced food production contributes a large portion of GHG emissions, this Article aims to analyze the impacts that the exclusion of the livestock sector, in efforts to tackle climate change, would have on compliance with international treaties on the subject, especially the Paris Agreement. One conclusion reveals that state parties, by ignoring the sector, will violate several articles of the Agreement, which will likely lead to the failure of its main purpose of holding the increase in the global average temperature to well below 2°C.

Keywords: Climate change; greenhouse gas emissions; livestock; international law; international treaties; Paris Agreement; mitigation; diet; meat consumption

A. Introduction

Climate change stands as the paramount challenge confronting humanity in the contemporary era. Its far-reaching consequences touch every aspect of our lives, from the environment and ecosystems to economies and human well-being. The warming of our planet, the escalating frequency of extreme weather events, and disruptions to vital resources like water and food supply emphasize the dire urgency of this issue. The collective responsibility to limit global warming and mitigate its impacts cannot be overstated. Climate change represents an environmental crisis and a profound threat to social stability and economic prosperity, underscoring the vital importance of immediate and comprehensive action.

While countries and international organizations have made some progress in addressing the climate crisis, there remains a glaring blind spot in the global response: the significant greenhouse gas (GHG) emissions associated with livestock and meat consumption. The livestock industry contributes significantly to carbon emissions through methane production, deforestation for pastureland, and intensive feed production. Nevertheless, this major emitter has always been ignored or downplayed in global and national climate policies and discussions.

This series of Articles is dedicated to a comprehensive exploration of livestock GHG emissions from three distinct angles: International law, international politics, and deforestation, with a particular focus on the Amazon rainforest. In this first Article, we delve into the subject through

the lens of international law, employing a qualitative documentary and bibliographical methodology.

The primary objective of this Article is to critically assess the viability and likelihood of successful outcomes concerning the international conventions on climate change if the matter of livestock and meat consumption remains inadequately addressed. We intend to explore the complex interplay between livestock-related GHG and the overarching goals, especially of the Paris Agreement, which is the most relevant treaty on climate change.

To achieve this, in addition to the introduction and final remarks, this Article is divided into three other parts. The first part examines the facts about livestock farming and global warming. This section reveals the main areas in which the livestock sector contributes to climate change according to relevant scientific evidence on the subject. The second part looks into the Paris Agreement, conducting a legal analysis of possibly violated articles of the treaty. Finally, the third part explores prospective avenues for international and domestic laws to address the livestock sector.

B. The Facts on Livestock and Climate Change

Around ninety billion animals are slaughtered annually for meat production.¹ Even though this figure is already astonishing, projections indicate a significant growth in the next decades, as the world's current population of eight billion is expected to reach 9.8 billion by the year 2050.² According to the Food and Agricultural Organization of the United Nations (FAO), this population growth, rising incomes, and the ongoing trend toward urbanization present an unprecedented set of challenges for global food and agricultural systems, which emerge in a context where finite natural resources are not expanding in parallel.³ Furthermore, with an emerging middle class globally, the situation is likely to worsen. As incomes rise, diets are anticipated to become more affluent and diverse, with a particularly robust increase in the consumption of animal-source foods.⁴ Projections indicate that by 2050, the demand for meat and milk is expected to surge by seventy-three percent and fifty-eight percent, respectively, when compared to their 2010 levels.⁵

It is scientifically proven that the livestock sector has a huge environmental impact, being a major contributor to global warming in several areas, of which we highlight three.⁶ First, the release of methane, which is a potent short-lived GHG that possesses an eighty-fold greater warming impact than carbon, stands as a serious concern.⁷ As indicated by the International Energy Agency (IEA), approximately thirty percent of the documented global warming since the beginning of the Industrial Revolution can be attributed to methane.⁸ Notably, a significant

¹Kitty Block, *More Animals than Ever Before—92.2 Billion—Are Used and Killed Each Year for Food*, HUMANE SOC'Y U.S. (June 5, 2023), <https://www.humanesociety.org/blog/more-animals-ever-922-billion-are-used-and-killed-each-year-food>.

²U.N. DESA, Population Div., *The World Population Prospects: The 2017 Revision at 22*, U.N. Doc. ESA/P/WP/248 (2017), https://population.un.org/wpp/publications/files/wpp2017_keyfindings.pdf.

³P.J. GERBER, H. STEINFELD, B. HENDERSON, A. MOTTET, C. OPIO, J. DIJKMAN, A. FALUCCI & G. TEMPIO, FAO, *TACKLING CLIMATE CHANGE THROUGH LIVESTOCK 1* (2013).

⁴Dominik Wissner, Şeyda Özkan, Lydia Lanzoni, Giuseppe Tempio, Francesco N. Tubiello, Aimable Uwizeye, Carolina Lizarralde Piquet, Giuseppina Cinardi, Saskia Reppin, Marta Dondini, Timothy Robinson, Monica Rulli, FAO, *PATHWAYS TOWARDS LOWER EMISSIONS: A GLOBAL ASSESSMENT OF THE GREENHOUSE GAS EMISSIONS AND MITIGATION OPTIONS FROM LIVESTOCK AGRIFOOD SYSTEMS 12* (2023).

⁵See P.J. Gerber et. al, *supra* note 3.

⁶See Karen Dopelt, Pnia Radon, and Nadav Davidovitch, *Environmental Effects of the Livestock Industry: The Relationship between Knowledge, Attitudes, and Behavior among Students in Israel*, 16(8) INT'L J. ENV'T RESP. PUB. HEALTH 1359 (2019) (affirming that the meat industry has a significant impact on global warming by inflicting global impacts on water, soil, use and consumption of natural resources, and the extinctions of animals and plant life).

⁷UNEP, *Methane Emissions are Driving Climate Change. Here's how to Reduce Them* (20 Aug 2021), <https://www.unep.org/news-and-stories/story/methane-emissions-are-driving-climate-change-heres-how-reduce-them>

⁸IEA, *Global Methane Tracker 2022*, <https://www.iea.org/reports/global-methane-tracker-2022>.

portion of this methane stems from the digestive processes of cattle and the decomposition of hog manure, emitting more methane than the combined total of those generated by oil, gas, coal, and bioenergy.⁹

Second, land use is another major issue. Agricultural expansion, which includes pasture and feed crops for humans and animals, is the major driver of deforestation, accounting for almost 90%.¹⁰ Livestock grazing alone is responsible for 38.5% of the loss of carbon-absorbing forests.¹¹ In South America, for instance, almost three-quarters of deforestation is due to livestock grazing.¹² Nearly thirty percent of the ice-free land on the planet is currently taken up by farmed animals. A 2018 report by *Science* highlighted that while meat and dairy contribute only eighteen percent of the total consumed calories, they account for eighty-three percent of global farmland usage and sixty percent of the GHG emissions stemming from agricultural activities.¹³

Third, water use and pollution are also an acute problem. 2.3 billion¹⁴ people live in water-stressed countries and around four billion people undergo extreme water scarcity during at least one month of the year.¹⁵ As water demand increases and climate change alters freshwater ecosystems, these figures are expected to grow even more in the coming years and decades. In this context, livestock production proves to be once again inefficient and unsustainable. Apart from the pollution of aquatic and terrestrial ecosystems through excessive nitrogen and phosphorus inputs,¹⁶ massive amounts of water are necessary to sustain livestock—producing one kilogram of beef requires nearly fifteen thousand liters of water.¹⁷ Estimates are that the sector consumes around one third of all freshwater on the planet.¹⁸

Existing data on the environmental impacts of livestock farming have served as the basis for a series of studies on its effects on global warming. One of the most widely publicized studies was the FAO report, “Tackling Climate Change through Livestock,”¹⁹ which concluded that the sector contributed 14.5% to the climate crisis we are experiencing.²⁰ Despite being widely cited and used to inform the debate on GHG emissions from livestock farming, the report has methodological problems demonstrated by peer-reviewed articles, which reveal that the sector’s contribution has been underestimated. According to a peer-reviewed paper that revised the FAO report and used many other peer-reviewed studies on the impact of animal agriculture, the sector’s emissions are in the range between 16.5% and 28.1%.²¹ The author affirms that “given the shortcomings of the

⁹IEA, SOURCES OF METHANE EMISSIONS 2017 AND 2020, <https://www.iea.org/data-and-statistics/charts/sources-of-methane-emissions-2017-and-2020>.

¹⁰FAO, FRA 2020 REMOTE SENSING SURVEY 47 (2022), <https://www.fao.org/3/cb9970en/cb9970en.pdf>.

¹¹*Id.*

¹²*Id.* at 50.

¹³Joseph Poore & Thomas Nemecek, *Reducing Food’s Environmental Impacts Through Producers and Consumers*, 360 SCI. 987, 991 (2018).

¹⁴U.N. Water, *Summary Progress Update 2021: SDG 6 — Water and Sanitation for All*, U.N. WATER PUBLICATIONS 1, 7 (2021), https://www.unwater.org/sites/default/files/app/uploads/2021/12/SDG-6-Summary-Progress-Update-2021_Version-July-2021a.pdf.

¹⁵Mesfin M. Mekonnen & Arjen Y. Hoekstra, *Four Billion People Facing Severe Water Scarcity*, 2 SCI. ADVANCES 1, 1–6 (2016).

¹⁶Benjamin Leon Bodirsky, Kimberly M. Carlson, Michael Clark, Daniel Mason-D’Croz, Fabrice DeClerck, Jess Fanzo, H. Charles J. Godfray, Line J. Gordon, Mario Herrero, Malin Jonell, Luis Lassaletta, Brent Loken, Mike Rayner, Johan Rockström, Peter Scarborough, Marco Springmann, David Tilman, Max Troell, Sonja J. Vermeulen, Wim de Vries, Keith Wiebe, Walter Willett & Rami Zuray, *Options For Keeping the Food System Within Environmental Limits*, 562 NATURE 519, 519–25 (2018).

¹⁷Haydée Rodríguez, *Virtual Water: What We Do Not See*, ASOCIACIÓN INTERAMERICANA PARA LA DEFENSA DEL AMBIENTE (Sept. 23, 2013), <https://aida-americas.org/en/blog/virtual-water-what-we-do-not-see>.

¹⁸*We Need to Talk About Meat*, U.N. CLIMATE CHANGE (May 19, 2021), <https://unfccc.int/blog/we-need-to-talk-about-meat>.

¹⁹See P.J. Gerber et. al, *supra* note 3.

²⁰*Id.* at XII.

²¹Richard Twine, *Emissions from Animal Agriculture—16.5% Is the New Minimum Figure*, 13 SUSTAINABILITY 5 (2021).

second FAO report, the number may not be as low as 16.5%, which should be seen as a new minimum.²²

In addition to the questionable estimate, the FAO report has another weakness: It presents increased efficiency and sustainability in the livestock sector as the solution, without mentioning the need to reduce the production and consumption of animal-source products. Despite the implementation of diverse technological initiatives to enhance productivity, emissions from the sector persistently escalate.²³ While advancements in technology on the supply side are essential and welcome, they alone will not suffice to reduce emissions to the necessary extent.²⁴

Several scientific studies show that changing our diet and reducing meat consumption is imperative if we are to achieve the goal of maximum global temperature rise. A paper published in *Nature*²⁵—the most comprehensive analysis yet of the food system's impact on the environment²⁶—stated that Western countries need to reduce their beef consumption by ninety percent. The IPCC Special Report on Climate Change and Land also affirmed that the climate crisis cannot be prevented if we do not rapidly change the course of our food system. The EAT-Lancet Commission on Food, Planet, Health, a report written by thirty-seven scientists, says that a substantial shift in the diet is necessary to achieve a sustainable food system.²⁷ Another paper published in *Science* says that:

Today, and probably into the future, dietary change can deliver environmental benefits on a scale not achievable by producers. Moving from current diets to a diet that excludes animal products (table S13) (35) has transformative potential, reducing food's land use by 3.1 (2.8 to 3.3) billion ha (a 76% reduction), including a 19% reduction in arable land; food's GHG emissions by 6.6 (5.5 to 7.4) billion metric tons of CO₂eq (a 49% reduction); acidification by 50% (45 to 54%); eutrophication by 49% (37 to 56%); and scarcity-weighted freshwater withdrawals by 19% (–5 to 32%) for a 2010 reference year.²⁸

Despite several scientifically validated studies demonstrating the need to reduce the production and consumption of animal-sourced products, various organizations, countries and political leaders have largely ignored this fact. This is indeed an issue with major political and social repercussions, which explains why it has been largely avoided. The economic size of the livestock sector is huge, being estimated at \$487.46 billion in 2024,²⁹ and its political power is also enormous. Through the analysis of lobbying, subsidies, and regulations in the U.S. and the EU, a study³⁰ found that the meat industry is blocking green alternatives. While in the U.S. farmers received eight-hundred-times more public funding than plant-based meat groups, in the EU the animal farmers got twelve-hundred-times more public funding.

²²*Id.*

²³FAO, *Five practical actions towards low-carbon livestock* (2019), FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS 1, 1 (2019), <https://www.fao.org/3/ca7089en/ca7089en.pdf>.

²⁴See generally ROB BAILEY, ANTONY FROGGATT & LAURA WELLESLEY, *LIVESTOCK – CLIMATE CHANGE'S FORGOTTEN SECTOR: GLOBAL PUBLIC OPINION ON MEAT AND DAIRY CONSUMPTION* (2014).

²⁵See Bodirsky et al., *supra* note 16.

²⁶Damien Carrington, *Huge Reduction in Meat-Eating to Avoid Climate Breakdown*, GUARDIAN (Oct. 10, 2018), <https://www.theguardian.com/environment/2018/oct/10/huge-reduction-in-meat-eating-essential-to-avoid-climate-breakdown>.

²⁷See EAT-LANCET COMMISSION, *SUMMARY REPORT OF THE EAT-LANCET COMMISSION: FOOD PLANET HEALTH: HEALTHY DIETS FROM SUSTAINABLE FOOD SYSTEMS 3* (2019).

²⁸See Poore & Nemecek, *supra* note 13.

²⁹*Meat Industry Size & Share Analysis - Growth Trends & Forecasts (2024 - 2029)*, MORDOR INTELLIGENCE, [https://www.mordorintelligence.com/industry-reports/global-live-stock-and-meat-market-industry#:~:text=The%20Livestock%20and%20Meat%20Market%20size%20is%20estimated%20at%20USD,period%20\(2024%2D2029\)](https://www.mordorintelligence.com/industry-reports/global-live-stock-and-meat-market-industry#:~:text=The%20Livestock%20and%20Meat%20Market%20size%20is%20estimated%20at%20USD,period%20(2024%2D2029)).

³⁰Simona Vallone & Eric F. Lambin, *Public Policies and Vested Interests Preserve the Animal Farming Status Quo at the Expense of Animal Products Analog*, 6 ONE EARTH 1213, 1213–26 (2023).

This escapism from reality also explains the fact that a large part of the world population is unaware of the environmental impacts of the livestock sector. “Across all the emissions sectors asked about in the survey, recognition of the livestock sector as a contributor to climate change was markedly the lowest.”³¹ For example, more than double the number of participants recognized direct transport emissions as a significant factor compared to those who recognized meat and dairy production, despite the nearly equivalent contribution of both sectors to overall emissions.³²

The costs of continuing to ignore the facts will be very high not only for future generations but for all of us who live on Earth now. The year 2023 was already the warmest in one hundred twenty-five thousand years, according to European Union scientists.³³ Against this backdrop, this Article will analyze one of the likely consequences in the realm of international law: Non-compliance with the main treaty on climate change—the Paris Agreement—and the potential repercussions of that non-compliance.

C. The Paris Agreement

The main goal of the Paris Agreement³⁴ is to combat global warming, which requires “[h]olding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels”³⁵ The Agreement also aims at “[i]ncreasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development”³⁶ as well as “[m]aking finance flows consistent with a pathway towards low greenhouse gas emissions.”³⁷

The mechanism created by the Agreement to achieve its objectives is based on the same principle established by the Kyoto Protocol.³⁸ “[C]ommon but differentiated responsibility and respective capabilities.”³⁹ Nonetheless, unlike the Protocol, all state parties of the Paris Agreement, regardless of their level of economic development, must set their targets through nationally determined contributions (NDC). Each party must present successive NDCs that shall be communicated every five years and represent a progression over time.

Considering the facts presented about the inescapable need for the reduction of animal-source food production and consumption to tackle global warming, it is alarming to note that no original NDC from the G20 countries has addressed the issue.⁴⁰ In general, the main emitting sectors were addressed in the NDCs—energy, transport, industry, agriculture, and forestry—but the need to reduce the consumption of animal-based food was ignored. According to a study conducted by the NGO World Wide Fund For Nature (WWF), “while many countries mention the agriculture sector in their NDCs, very few set targets in relation to other stages of the food system, such as food loss and waste reduction, sustainable diets or food consumption.”⁴¹

³¹See BAILEY ET AL., *supra* note 24, at 18.

³²*Id.* at 19.

³³Kate Abnett & Gloria Dickie, *This Year ‘Virtually Certain’ to be Warmest in 125,000 Years, EU Scientists Say*, REUTERS (Nov. 8, 2023), <https://www.reuters.com/business/environment/this-year-virtually-certain-be-warmest-125000-years-eu-scientists-say-2023-11-08/>.

³⁴Paris Agreement to the United Nations Framework Convention on Climate Change, Dec. 12, 2015, T.I.A.S. No. 16-1104.

³⁵*Id.* at art. 2.1.a.

³⁶*Id.* at art. 2.1.b.

³⁷*Id.* at art. 2.1.c.

³⁸Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 11, 1997, 2303 U.N.T.S. 162.

³⁹*Id.* at art. 2.2.

⁴⁰Mike Shanahan, *Meat Still Missing from National Climate Change Commitments*, UNDER BANYAN (Nov. 11, 2021), <https://underthebanyan.blog/2021/11/11/meat-still-missing-from-national-climate-change-commitments/>.

⁴¹INGRID SCHULTE, HASEEB BAKHTARY, SIMON SIANTIDIS, FRANZISKA HAUPT, MARTINA FLECKENSTEIN & CLEMENTINE O’CONNOR, WORLD WIDE FUND FOR NATURE, ENHANCING NDCs FOR FOOD SYSTEMS: RECOMMENDATIONS FOR DECISION-MAKERS 9 (2020).

Now in 2023, the State Parties to the Agreement have already submitted their new NDCs and an analysis of the documents from the European Union,⁴² the United States,⁴³ China,⁴⁴ Brazil,⁴⁵ and India⁴⁶ reveals that the necessary change in the global dietary pattern continues to be ignored by the world's largest meat producers and consumers. The NDCs of the US and China were the only ones that indirectly mentioned the problem.⁴⁷ The US's NDC recognizes that "N₂O from fertilizer use and methane from farm animals' enteric fermentation and manure are other large sources of emissions."⁴⁸ Yet, it was limited to solutions based on optimizing productivity, by improving the management of manure and cropland nutrients.⁴⁹ Similarly, China's NDC proposes to reduce emissions by improving productivity and refining methods to treat and use manure.⁵⁰ Hence, neither of the NDCs mentioned dietary changes as a potential way of reducing emissions from livestock.

Against this backdrop, there is a real probability that the main goal of the Paris Agreement will not be achieved. Given the current world population, level of economic activity, and use of natural resources, it will take a truly hard effort to limit the global temperature increase to 1.5°C, which is the current maximum benchmark proposed by scientists if we are not to unleash far more drastic climate change effects on the planet.⁵¹ Virtually ignoring a sector—livestock—that is responsible for around twenty percent of GHG emissions appears to be an effective path to failure that not only will lead to climate chaos but will also mean that the enormous efforts of the other sectors will have been insufficient.

1. Legal Analysis of Possibly Violated Articles of the Agreement

When addressing potential violations of international conventions, we must resort to the Vienna Convention on the Law of Treaties from 1969, which regulates the subject. According to Article 60, 3 (b), "a material breach of a treaty . . . consists in the violation of a provision essential to the accomplishment of the object or purpose of the treaty."⁵² Four topics of the Paris Agreement stand out when analyzing the lack of initiatives in the livestock sector: The goal of maximum global temperature increase; the obligation for State Parties to be guided by the best available science; the obligation to conserve GHG sinks and reservoirs, including forests; and the obligation to make finance flows consistent with a pathway towards low greenhouse gas emissions. Beginning with the temperature increase limit of 1.5°C, as mentioned above, it constitutes one of the main goals of the Agreement on the following terms in Article 2.1:

This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of

⁴²Council Directive 14286/23, of the European Union and its Member States of Oct. 17, 2023, Submission to the UNFCCC on the update of the nationally determined contribution (NDC) of the European Union and its Member States, O.J. (C 484).

⁴³See generally NAT'L CLIMATE ADVISOR, U.S. NATIONALLY DETERMINED CONTRIBUTION, REDUCING GREENHOUSE GASES IN THE U.S.: A 2023 EMISSIONS TARGET (2021).

⁴⁴See generally CHINA'S ACHIEVEMENTS, NEW GOALS AND NEW MEASURES FOR NATIONALLY DETERMINED CONTRIBUTIONS (2021).

⁴⁵FEDERATIVE REPUBLIC OF BRAZIL, PARIS AGREEMENT NATIONALLY DETERMINED CONTRIBUTION (NDC) (March 21, 2022), <https://unfccc.int/sites/default/files/NDC/2022-06/Updated%20-%20First%20NDC%20-%20%20FINAL%20-%20PDF.pdf>

⁴⁶INDIA, INDIA'S UPDATED FIRST NATIONALLY DETERMINED CONTRIBUTION UNDER PARIS AGREEMENT (August 2022), <https://unfccc.int/sites/default/files/NDC/2022-08/India%20Updated%20First%20Nationally%20Determined%20Contrib.pdf>

⁴⁷See generally NAT'L CLIMATE ADVISOR, *supra* note 43; see also CHINA'S ACHIEVEMENTS, *supra* note 44.

⁴⁸See NAT'L CLIMATE ADVISOR, *supra* note 43, at 15.

⁴⁹*Id.* at 5.

⁵⁰See NAT'L CLIMATE ADVISOR, *supra* note 43, at 15.

⁵¹Kate Abnett, *Explainer: What's the Difference Between 1.5°C and 2°C of Global Warming?*, REUTERS (Nov. 9, 2021), <https://www.reuters.com/business/cop/whats-difference-between-15c-2c-global-warming-2021-11-07/>.

⁵²Vienna Convention on the Law of Treaties, May 23, 1969, 1155 U.N.T.S. 331.

sustainable development and efforts to eradicate poverty, including by: (a) Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change.⁵³

Although the failure to adequately address the livestock sector will probably lead to the non-fulfillment of this objective, this would not be a clear and easily demonstrable violation of Article 2, 1 (a). As explained before, countries must meet the climate threshold set by the agreement through NDCs. When state parties set their targets, it is assumed that they do so in good faith, with the real intention of collaborating effectively to achieve the treaty's objective. Thus, if the targets set encompass sectors that are real GHG emitters and are met, *prima facie* there is no violation of the article when they ignore animal-source food production and consumption in their NDCs.

Nevertheless, the parts that make up a piece of legislation must be interpreted taking into account the entire law, and not just the isolated meaning of each provision. In this sense, the clearer violation of three other legal topics—foreseen in six different articles of the Agreement—gives rise to the interpretation that Article 2, 1 (a) is also being violated by ignoring the livestock sector. The provisions address three topics: Reliance on the best available science, the conservation of GHG reservoirs and sinks, and the need to make finance flows consistent with a pathway towards low greenhouse gas emissions. In addition to the Agreement's Preamble, the three articles setting the obligation to act per the best available science are the following:

In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty.⁵⁴

...

Parties acknowledge that adaptation action should follow a country-driven, gender-responsive, participatory and fully transparent approach, taking into consideration vulnerable groups, communities and ecosystems, and should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems, with a view to integrating adaptation into relevant socioeconomic and environmental policies and actions, where appropriate.⁵⁵

...

The Conference of the Parties serving as the meeting of the Parties to this Agreement shall periodically take stock of the implementation of this Agreement to assess the collective progress towards achieving the purpose of this Agreement and its long-term goals—referred to as the “global stocktake.” It shall do so in a comprehensive and facilitative manner, considering mitigation, adaptation and the means of implementation and support, and in the light of equity and the best available science.⁵⁶

⁵³See Paris Agreement, *supra* note 34, at art. 2.1.

⁵⁴*Id.* at art. 4.1.

⁵⁵*Id.* at art. 7.5.

⁵⁶*Id.* at art. 14.1.

Before analyzing whether there is a potential violation of these articles, it is necessary to engage in two discussions: The possible legal interpretations of the term “best available science” and the potential conflict between the protection of farming communities and the adoption of science-based measures. Concerning the legal interpretation, it should be noted that, although the use of the best available science is provided for in many domestic and international laws and used in judicial decisions, the term is usually not accompanied by criteria that objectively define it. One possible consequence of this scenario is that the parties involved in legal proceedings or political discussions may resort to using questionable science claiming, however, that it is the best available science. Domestically, this has occurred rather often, which has led to deferred decisions.

In the case of global warming, there are a huge number of studies, thus it is easy to find countless papers and reports on the same subject that have contradictory conclusions. Therefore, it is imperative to be able to define the meaning of the term “best available science” to objectively understand if the failure to address the livestock sector represents a potential violation of the Paris Agreement. According to the literature review and case law analysis below, three main approaches can be used to define the best available science in climate change cases.

The first would be to rely on universally established criteria to determine scientific credibility. Journals’ excellent reputations, rigorous peer-review process before publication and well-designed and robust methodologies, for instance, are key elements of any reliable scientific research in all areas of knowledge. “High-quality science adheres to well-established scientific process.”⁵⁷ Litigants and courts have relied on academic research given that it provides important scientific analysis in environmental cases.⁵⁸

The second approach would be to use other sources of climate science, not academic ones. Examples include expert independent research institutes and national scientific bodies. Many countries have technical bodies that work with scientific parameters and are responsible for measuring GHG emissions, deforestation, and other environmental indicators. The data collected and information made available by these institutions are often substantiated by recognized scientific methodologies and therefore validated by courts or policymakers. For instance, the German Constitutional Court and the Administrative Court of Paris have already based their decisions on the opinions of national environmental bodies.⁵⁹

The third approach would be to resort to the reports of the IPCC. The fact that it is a hybrid body—scientific and political—raises some questions⁶⁰ about its commitment to unbiased science, given that political interests are not always compatible with the data produced by science. Notwithstanding this fact, both the jurisprudence and a considerable part of the literature acknowledge the IPCC as the primary authority in the domain of climate science. Each IPCC’s working group and the reports published usually involve hundreds of scientists who review thousands of research papers on the relevant topics.⁶¹ The view that the IPCC is the most

⁵⁷P. J. Sullivan, *Defining and Implementing Best Available Science for Fisheries and Environmental Science, Policy, and Management*, 31 FISHERIES 460, 463 (2006).

⁵⁸Lucy Maxwell, Sarah Mead & Dennis Van Berkel, *Standards for Adjudicating the Next Generation of Urgenda-Style Climate Cases*, 13 J. HUM. RTS. & ENV’T 35, 49 (2022).

⁵⁹*Id.*

⁶⁰Many studies argue that the 1.5°C threshold was not a product of scientific debate, but rather the outcome of political diplomacy. Given that the studies on the subject indicate that the maximum temperature increase should be even lower—approximately 1.3°C—the arguments about the need to include the livestock sector in the fight against global warming would not be invalidated but rather strengthened. See Andrea Rodgers, Lauren E. Sancken, & Jennifer Marlow, *The Injustice Of 1.5°C–2°C: The Need For A Scientifically Based Standard Of Fundamental Rights Protection In Constitutional Climate Change Cases*, 40 VA. ENV’T L.J. 102, 103–50 (2022).

⁶¹See LEA MAIN-KLINGST & SOPHIE MARJANAC, CLIENT EARTH, LEGAL ANALYSIS: REQUEST FOR AN ADVISORY OPINION FROM THE INTERNATIONAL TRIBUNAL FOR THE LAW OF THE SEA 14 (2023) (explaining that for the IPCC’s Sixth Assessment Report, Working Group I “comprised 234 scientists who reviewed over 14,000 scientific research papers” and Working Group III “entailed 278 authors reviewing over 18,000 scientific papers and almost 60,000 comments from experts and governments”).

authoritative institution when it comes to assessing the best available science concerning climate change has been corroborated, for instance, by Christina Voigt⁶² and the NGO Client Earth⁶³ in a legal analysis on a request for an advisory opinion from the International Tribunal for the Law of the Sea. The temperature increase limit proposed by the IPCC has also been used in several landmark domestic court decisions, such as *Urgenda*⁶⁴ (Netherlands) and *Irish Climate Case*.⁶⁵

Irrespective of which of the three approaches is more prevalent, courts and litigants in environmental cases usually rely on all the sources previously analyzed.⁶⁶ Considering that the scientific data presented in the first part of this Article originate either from publications in journals of unquestionable reputation such as *Nature* and *Science*, as well as national scientific institutions and the IPCC, this work is based on what is recognized as the best available science in the contemporary legal perspective on climate change.

The second topic that needs to be addressed is the fact that the same legal provision⁶⁷ in the Paris Agreement determines the use of the best available science and the protection of the most vulnerable communities and social groups. In this context, could countries exclude the livestock sector in their NDCs on the grounds of protecting their rural communities without violating the Paris Agreement? Taking into account the scientific predictions⁶⁸ that it is not possible to limit global warming to 1.5°C without reducing emissions from all the main emitting sectors—which includes livestock—the answer is no. The omission of the countries would lead to a breach of the treaty for two main reasons.

First, the argued protection of farming communities would come at the expense of non-compliance with the object of the treaty. The object and purpose are the cornerstone of any international convention, and allowing a secondary provision to undermine the treaty's primary objective would contradict the very essence of the general Law of Treaties—The Vienna Convention of 1969. The pivotal relevance of a treaty's object and purpose is provided for in many articles of the Vienna Convention. Article 18, for instance, affirms that a “State is obliged to refrain from acts which would defeat the object and purpose of a treaty,” even when ratification is pending, and the State is not yet formally bound by the treaty.⁶⁹ In this sense, if even a country that is not formally part of a treaty has the negative obligation not to frustrate the convention's object, there is no doubt that the state parties have both a negative and positive obligation regarding the subject.

According to Jonas and Saunders, “[t]he command to interpret a treaty ‘in light of its object and purpose’ suggests a holistic mode of interpretation that accounts for more than the goals of specific treaty provisions and encompasses the normative logic that presents itself when the entirety of the treaty's provisions are considered together.”⁷⁰ Therefore, it would be illegal for a state party to a treaty to use one of its provisions—protection of communities—to evade fulfilling the central objective of the convention: Combating global warming.

The second reason relates to a misconstrued interpretation of the meaning of protection of more vulnerable social groups and communities in the context of climate change. Although the Paris Agreement is a treaty that requires immediate and ongoing action, it encompasses a much broader and long-term objective: To fight global warming, allowing the Earth to remain a habitable planet. By interpreting the protection of vulnerable groups with a short-term

⁶²Christina Voigt, *The Power of the Paris Agreement in International Climate Litigation*, 32 REV. EUR. COMP. INT'L ENV'T L. 237, 237–49 (2023).

⁶³See generally MAIN-KLINGST & MARJANAC, *supra* note 61.

⁶⁴HR 13 januari 2020, NJ 2020, 19/00135 m.nt. Engels (*Urgenda Foundation/State of the Netherlands*)(Neth.).

⁶⁵*Friends of the Irish Environment CLG v. The Government of Ir.* [2019] IECHR 747 (H. Ct.) (Ir.).

⁶⁶See Maxwell et al., *supra* note 58, at 49.

⁶⁷Paris Agreement, *supra* note 34.

⁶⁸See Bodirsky et al., *supra* note 16; Twine, *supra* note 21; and Vallone & Lambin, *supra* note 30.

⁶⁹Vienna Convention on the Law of Treaties art. 18, May 23, 1969 1155 U.N.T.S. 331; 8 I.L.M. 679 (1969).

⁷⁰David S. Jonas & Thomas N. Saunders, *The Object and Purpose of a Treaty: Three Interpretive Methods*, 565 Vand. L. Rev. 565, 579 (2010).

perspective, there will be a hyper-focus on the immediate economic losses of the sectors and how this affects the weakest side of each production chain. This, however, would allow the emission of prohibitive levels of greenhouse gases to continue, which would lead to the catastrophic climate results predicted in various scientific studies. In this scenario of catastrophe, the most affected will inevitably be the vulnerable groups targeted by the Paris Agreement. In other words, it would be contradictory to protect communities in a manner that, soon after, they suffer from much more severe events, partly brought about by state-sponsored policy that was supposed to be a protection. Ultimately, the immediate protection allowing the maintenance of the status quo and emissions from rural communities would put those same communities at a greater risk.

This does not mean that the legal provisions that determine the protection of vulnerable groups must be disregarded. Protection only needs to be interpreted considering the central objective of the Agreement, which is to limit global warming. Accordingly, states could and should provide immediate support to vulnerable communities that would be affected, such as small livestock producers, if policies that lead to a significant reduction in the consumption of animal products were adopted. Taking into consideration that the Earth already reached a point of global warming where extreme weather events are already a reality, all vulnerable groups and communities affected in the short, medium, and long run must be treated as a priority in efforts to combat climate change by all State parties to the Agreement. In this regard, the implementation of protection measures can be executed through several means, except allowing the livestock or any other major sector to keep or increase its emissions as though its contribution to climate change were insignificant.

Against this backdrop, when the state parties to the Agreement formulate NDCs that do not even mention the problem related to the livestock sector, there is a deliberate choice to ignore solid scientific data on the subject. Consequently, this means that there is a deliberate choice not to comply with the legal obligation to act according to the best available science. Finally, when this violation leads to non-compliance with the central objective of the treaty—limiting global warming to 1.5°C—it remains clear that there will also be a breach of the aforementioned Article 2, 1 (a).

In addition to the absence of the issue in the NDCs, the Conference of the Parties (COP), which is responsible for annually assessing the collective progress towards achieving the agreement's objectives, also has a legal duty to act according to the best available science. Although it is an eminently political body, its legal obligation to be based on credible science is clearly defined in Article 14, 1. Notwithstanding this fact, every single COP in the past years has failed to address the livestock sector in a manner that includes the need to reduce the production and consumption of animal-source food. The COP 27 was the first one to give some emphasis on the agricultural sector, but once again it continued to ignore the impact of livestock on climate change.⁷¹ The document drafted on the topic—Food and Agriculture for Sustainable Transformation Initiative⁷²—did not even mention the issue.

At COP 28, a toolkit on agriculture and food was released, stating that “overwhelming scientific evidence indicates that nothing other than the widespread transformation of food and agriculture systems is required to achieve the global climate change goals set forth in the Paris Agreement.”⁷³ Yet, the toolkit did not point out the need to reduce consumption of animal-based food. Among the documents at COP 28, there were the final Agreement⁷⁴ and a Declaration on sustainable agriculture, resilient food systems, and climate action,⁷⁵ but neither of them made any reference to the livestock sector, let alone the urgent need for a global diet change.

⁷¹George Monbiot, *There's one big subject our leaders at Cop27 won't touch: livestock farming*, THE GUARDIAN (Nov. 9, 2022).

⁷²FAO, *Food and Agriculture for Sustainable Transformation Initiative* (2022), FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, 1 (2022), <https://www.fao.org/3/cc2186en/cc2186en.pdf>.

⁷³FAO, *Agriculture, Food and Climate National Action Toolkit*, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS (2023), <https://www.fao.org/3/cc9049en/cc9049en.pdf>.

⁷⁴U.N. Conference of the Parties serving as the meeting of the Parties to the Paris Agreement, *First global stocktake*, U.N. Doc. FCCC/PA/CMA/2023/L.17 (Dec. 13, 2023), https://unfccc.int/sites/default/files/resource/cma2023_L17_adv.pdf.

⁷⁵*Declaration on Sustainable Agriculture, Resilient Food Systems, and Climate Action*, UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (2023), <https://www.cop28.com/en/food-and-agriculture>.

When it comes to the subject of conservation of GHG reservoirs and sinks, including forests, the provisions in the Agreement state that:

“[P]arties should take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases as referred to in Article 4, paragraph 1 (d), of the Convention, including forests.”⁷⁶

Parties are encouraged to take action to implement and support, including through results-based payments, the existing framework as set out in related guidance and decisions already agreed under the Convention for: Policy approaches and positive incentives for activities relating to reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries; and alternative policy approaches, such as joint mitigation and adaptation approaches for the integral and sustainable management of forests, while reaffirming the importance of incentivizing, as appropriate, non-carbon benefits associated with such approaches.”⁷⁷

The data presented in the first part of this Article reveals that almost ninety percent of the current deforestation is driven by agricultural expansion.⁷⁸ While livestock grazing alone is responsible for nearly forty percent of the loss of forests⁷⁹, we must not forget that over one-third of agriculture is used for animal feed in the world.⁸⁰ In countries that are major meat/dairy producers, this number tends to be even higher. In the United States, for example, animal feed consumes sixty-seven percent of crops, while only twenty-seven percent are directly consumed by humans.⁸¹ The city with the highest GHG emissions in Brazil is *Sao Felix do Xingu*, which has the country’s largest herd⁸². Its per capita emission is six times bigger than that of Qatar, which is the country with the highest per capita emission in the world.⁸³ Although *Sao Felix do Xingu* only has one hundred thirty thousand inhabitants, it has reached this position because of livestock production and deforestation. Thus, much of the land used to raise animals and produce grain to feed them is forests that would not be cut down or land that could be converted into reforestation sites—GHG sinks—if the livestock sector decreased.

A study conducted by FAO in partnership with NASA using satellite data revealed that the vast majority of deforestation occurred in tropical biomes.⁸⁴ Conversion to cropland dominates forest loss in Africa and Asia, with over seventy-five percent of the forest area lost converted to cropland.⁸⁵ In South America, seventy percent of deforestation is due to livestock grazing.⁸⁶ Although technical improvement on the supply side is necessary and welcome, it

⁷⁶See Paris Agreement, *supra* note 34, at art. 5.1.

⁷⁷*Id.* at art. 5.2.

⁷⁸See FAO, *supra* note 10, at 47.

⁷⁹*Id.*

⁸⁰Christian Schader, Adrian Muller, Nadia El-Hage Scialabba, Judith Hecht, Anne Isensee, Karl-Heinz Erb, Pete Smith, Harinder P. S. Makkar, Peter Klocke, Florian Leiber, Patrizia Schwegler, Matthias Stolze and Urs Niggli, *Impacts of feeding less food-competing feedstuffs to livestock on global food system sustainability*, J. R. Soc. Interface 12: 20150891, 2 (2015).

⁸¹Emily S. Cassidy, Paul C. West, James S. Gerber & Jonathan A. Foley, *Redefining Agricultural Yields: From Tonnes to People Nourished Per Hectare*, 8 ENV’T. RSCH. LETTER 1, 3 (2013).

⁸²EMA, Oito dos dez municípios que mais emitem gases de efeito estufa estão na Amazônia (June 2022), <https://energiaemambiente.org.br/oito-dos-dez-municipios-que-mais-emitem-gases-de-efeito-estufa-estao-na-amazonia-20220617>

⁸³IPAM Amazônia, Amazonian municipalities dominate carbon emissions in Brazil (Mar. 19, 2021), <https://ipam.org.br/amazonian-municipalities-dominate-carbon-emissions-in-brazil/#:~:text=Each%20resident%20of%20S%C3%A3o%20F%C3%A9lix,capita%20emissions%20in%20the%20world.>

⁸⁴See FAO, *supra* note 10, at 30.

⁸⁵See FAO, *supra* note 10, at 50.

⁸⁶*Id.*

will not be enough to curb emissions to the required level, especially considering the projected increase in world population and consumption of meat and dairy.⁸⁷ Various technological initiatives to improve productivity have already been adopted in the past decade, but the sector's emissions continue to rise.⁸⁸

Therefore, keeping the current levels of supply and demand for animal-source food is incompatible with the Agreement's provisions that determine the conservation of forests and the reduction of emissions from deforestation and forest degradation. In this regard, it is easier to identify, as violators of the provisions, the countries that have forests on their territory and fail to conserve them. Yet, this responsibility should also fall on the main meat-consuming countries, even if most of them do not have forests on their territories, such as the developed ones. Supply is determined by demand, and the deliberate choice not to create any public policy or legislation aimed at reducing animal-source food consumption directly affects the preservation of forests.

Lastly, the obligation to make finance flows consistent with a pathway towards low greenhouse gas emissions is foreseen in Article 2, paragraph 1(c) of the Agreement:

"1. This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:

(c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development."⁸⁹

A peer-reviewed paper recently published by scientists from Stanford University has revealed that animal farming in the US and the EU receives most of the public financial support for food producers and still heavily relies on public subsidies.⁹⁰ Simultaneously, the meat alternative sector barely gets any public funding if compared to livestock.

"The production sector of the INC [livestock] system was the largest beneficiary of government spending. In line with historical support to agricultural producers at large, the INC producers in the EU received greater assistance than those in the US. The criteria for the distribution of financial support affects producer behavior, potentially locking in the system in producing livestock and feed crops and preventing a transition toward more sustainable products. Subsidies linked to current production, such as the US crop insurance and EU voluntary coupled payments, induce farmers to become less risk-averse and less motivated to leave current production systems or to abandon the sector. The Organization for Economic Cooperation and Development (OECD) found that, between 2018 and 2020 and compared to the EU, a higher share of total US agricultural producer support was delivered through market-distorting measures that hinder a transition of production systems, such as payments based on commodity output and input use.

[T]he cattle population was stable in the EU during 2014–2020 and cattle producers were highly dependent on direct payments, which constituted at least 50% of their income. These payments incentivized farmers to maintain herd size, keep pasture in production, or increase the level of supported activity, potentially hindering climate-mitigation efforts."⁹¹

⁸⁷See BAILEY ET AL., *supra* note 24, at 11.

⁸⁸See FAO, *supra* note 23, at 1.

⁸⁹Paris Agreement, *supra* note 34, at art. 2.1.

⁹⁰See Vallone & Lambin, *supra* note 30, at 1219.

⁹¹*Id.*

In this context, increasing or maintaining large economic incentives for a highly GHG-emitting sector such as livestock farming would already be a potential violation of the obligation provided for in Article 2, paragraph 1 (c), as finance resources do not flow, but remain stuck in highly polluting sectors instead. Furthermore, when this policy directly interferes with the growth of low-emission food industries, as suggested by the research, it becomes even clearer that financial flows are not moving towards fulfilling the main goal of the Paris Agreement. In this case, it would be a potential violation by action, unlike all the other hypotheses presented, in which the violation would arise from state omission. The previous discussion on the object and purpose of the treaty is also pertinent to this topic. Although states are not obliged to include any specific topic in their NDCs, they are prohibited from acting in such a way as to frustrate the object of a treaty to which they are party. The maintenance of high subsidies and the alleged obstruction of the growth of low-emission food industries would constitute an act contrary to the nature of the Paris Agreement.

Although action and omission are different behaviors, it is unquestionable that both can give rise to international responsibility. According to the Draft Articles on Responsibility of States for Internationally Wrongful Acts, “[t]here is an internationally wrongful act of a State when conduct consisting of an action or omission (a) is attributable to the State under international law; and (b) constitutes a breach of an international obligation of the State.”⁹²

Even though no precedent has been found acknowledging omissions as a violation of the obligation to rely on the best available science, there are environmental cases addressing state omissions, such as *La Oroya v. Peru*⁹³ in the Inter-American Court of Human Rights. The same court has also ruled in an advisory opinion⁹⁴ that state omissions in the environmental field can lead to violations of the international human rights treaties of the Inter-American system.

As for the Agreement, there is no organ able to impose countermeasures or sanctions against countries that breach the treaty. Although Article 15 has a provision for a mechanism to facilitate the Agreement’s implementation, composed of an expert-based committee, it has no contentious legal nature. The main duty of the Paris Agreement Implementation and Compliance Committee (PAICC) is to analyze whether the parties are fulfilling their obligations under the agreement and to take measures to facilitate implementation and promote compliance.⁹⁵ The obligations refer mainly to the parties’ NDCs and mandatory reports and communications of information as determined in some articles of the Agreement. The Committee’s duties must be performed “in a manner that is transparent, non-adversarial and non-punitive.”⁹⁶ Given that the violations concerning the livestock sector do not refer to non-compliance with NDCs, but mainly to the absolute absence of the issue in national initiatives to tackle global warming, the committee’s competence would not apply in this context.

Nevertheless, the Committee also has the competence to analyze systemic issues and make recommendations on the following terms:

“The Committee may identify issues of a systemic nature with respect to the implementation of and compliance with the provisions of the Paris Agreement faced by a number of Parties

⁹²Responsibility of States for Internationally Wrongful Acts, G.A. Res. 56/83, art. 2, U.N. Doc. A/RES/56/83 (Dec. 12, 2001), reprinted in [2001] 2 Y.B. Int’l L. Comm’n 26, U.N. Doc. A/CN.4/SER.A/2001/Add.1 (Part 2).

⁹³See generally *La Oroya v. Peru*, Preliminary Objections, Merits, Reparations and Costs, Judgment, Inter-Am. Ct. H.R. (ser. C) No. 511 (Nov. 27, 2023).

⁹⁴The Environment and Human Rights (State obligations in relation to the environment in the context of the protection and guarantee of the rights to life and to personal integrity – interpretation and scope of Articles 4(1) and 5(1) of the American Convention on Human Rights), Advisory Opinion OC-23/17, Inter-Am. Ct. H.R. (ser. A) No. 23 (Nov. 15, 2017).

⁹⁵U.N. Conference of the Parties Serving as the Meeting of the Parties to the Paris Agreement, *Decisions Adopted by the Conference of the Parties Serving as the Meeting of the Parties to the Paris Agreement*, U.N. Doc. FCCC/PA/CMA/2018/3/Add.2 (Mar. 19, 2019), https://unfccc.int/sites/default/files/resource/CMA2018_03a02E.pdf.

⁹⁶See Paris Agreement, *supra* note 34, at art. 15.

and bring such issues and, as appropriate, any recommendations to the attention of the CMA for its consideration. The CMA may, at any time, request the Committee to examine issues of a systemic nature. Following its consideration of the issue, the Committee shall report back to the CMA and, where appropriate, make recommendations. In addressing systemic issues, the Committee shall not address matters that relate to the implementation of and compliance with the provisions of the Paris Agreement by an individual party.”⁹⁷

Considering that the committee is made up of experts, acting based on science is imperative. The impact of the livestock sector on climate change and the failure of state parties to address the issue could be recognized as a systemic issue by the committee and be the subject of recommendations. Even though the Committee does not function as an enforcement mechanism, the fact that it can raise important issues such as the livestock carbon footprint is already one step towards acknowledging the problem and taking action. Despite this theoretical possibility, no PAICC report has addressed the topic thus far, and a potential role for international law in this context is being wasted.

One last point that should be made clear is that, although the Paris Agreement gives state parties the freedom to define their emission reduction initiatives through NDCs, they need to be compatible with the macro-objective of the treaty, which is currently a maximum temperature increase of 1.5°C. Furthermore, under the good faith principle, the NDCs need to be theoretically achievable. In this context, a hypothetical goal of immediately prohibiting emissions from any major emitting sector, such as fossil fuels, to allow emissions from the livestock sector to remain unchanged, would not be legally valid because it is not feasible. Fossil fuels generate eighty percent⁹⁸ of the world’s energy, which includes sixty percent of electricity⁹⁹ and heating¹⁰⁰ and ninety-five percent of transportation.¹⁰¹ It is highly unlikely that the world or any specific country will be willing to leave sixty percent of its population without electricity, heating in winter or any form of transportation just to avoid a reduction in meat and dairy consumption. At COP28, despite great pressure for states to commit to phasing out fossil fuels, the final agreement concluded with the use of the weaker term “transition away,”¹⁰² with an immediate ban never being considered at any political level.

According to Copernicus Climate Change Service, 2023 was the hottest year on record, being “1.48°C warmer than the 1850-1900 pre-industrial level.”¹⁰³ Noticeably, the Earth is already frighteningly close to the maximum temperature increase established as safe by the latest scientific research adopted by the IPCC. This reinforces the studies presented before¹⁰⁴ which claim that compliance with the Paris Agreement is impossible without a drastic change in the global diet. Even if the choice to ban fossil fuels immediately were feasible—which it is not—we are only 0.5°C away from the maximum increase, and the livestock sector accounts for an average of twenty percent of GHG emissions. Therefore, significant and simultaneous efforts by all major emitting sectors are the only measure capable of producing effective results in the fight against global warming.

⁹⁷See U.N. Conference, *supra* note 95.

⁹⁸*Fossil Fuels*, ENV’T ENERGY STUDY INST. (Jul. 22, 2021), <https://www.eesi.org/topics/fossil-fuels/description..>

⁹⁹*Fossil Fuel Share in Electricity Production Worldwide From 200 to 2022*, STATISTA (Nov. 29, 2023), <https://www.statista.com/statistics/1303803/global-fossil-fuel-share-in-power-generation/#:~:text=Global%20fossil%20fuel%20power%20generation%20share%202000%2D2022&text=The%20fossil%20fuel%20share%20in,reach%2061.27%20percent%20in%202022.>

¹⁰⁰*Tracking Heating*, INT’L ENERGY AGENCY, <https://www.iea.org/energy-system/buildings/heating#:~:text=The%20role%20of%20efficient%20and,60%25%20of%20heating%20energy%20demand.>

¹⁰¹*Transport: Increasing Oil Consumption and Greenhouse Gas Emissions Hamper EU Progress Towards Environment and Climate Objectives*, EUR. ENV’T AGENCY (Feb. 13, 2023), <https://www.eea.europa.eu/publications/transport-increasing-oil-consumption-and.>

¹⁰²See U.N. Conference of the Parties, *supra* note 74, at 5.

¹⁰³2023 is the Hottest Year on Record, with Global Temperatures Close to the 1.5°C Limit, COPERNICUS CLIMATE CHANGE SERV. (Jan. 9, 2024), <https://climate.copernicus.eu/copernicus-2023-hottest-year-record.>

¹⁰⁴See Bodirsky et al., *supra* note 16.

D. Prospective Avenues for International and Domestic Laws to Address the Livestock Sector

As awareness of the gravity of climate change grows, countries are increasingly striving to adopt legislation and policies that effectively combat global warming. Given that the Paris Agreement was not structured on standardized targets predetermined in the treaty itself, but based on goals determined nationally by the parties, domestic laws and policies become essential for compliance with this particular international agreement. Against this backdrop, we should identify the role and limitations of domestic and international law instruments to address GHG emissions from the livestock sector.

A global challenge that requires targets to be met by the planet can best be tackled by global legislation. Without international concerted action, achieving the bold goals that the fight against global warming demands would be difficult. Although the issue is politically controversial, international law has played an important role, serving as an instrument for drawing up binding legal rules, with the Kyoto Protocol in the 1990s and the Paris Agreement currently in force.

Whereas there has been political engagement to articulate general treaties on climate change, the creation of a binding international legal instrument targeting emissions from the livestock sector is highly improbable. Given the scarcity of international regulation for specific sectors,¹⁰⁵ the likelihood of such regulation for one that is perceived as particularly sensitive appears even less feasible. Furthermore, if the regulation of lifestyle issues, such as dietary choices, is already controversial and difficult at the domestic level, it is even more complicated at the level of international law. This prompts us to analyze whether there are alternative instruments of international law that can be used to address the subject.

The measure that would possibly have the greatest effect on reducing the consumption of animal-based foods is not directly related to the drafting and enforcement of domestic or international laws, which would be to raise global awareness of the impact of the livestock sector on global warming. As demonstrated in the first part of this Article, many consumers, particularly those who eat meat more frequently, do not consider meat consumption to have an adverse environmental impact, which creates an awareness gap that hinders a demand-side response.¹⁰⁶

Globally, international organizations could run awareness campaigns and emphatically change global dietary guidelines. One of the greatest capacities of international organizations is to act in the realm of soft law, by formulating declarations, recommendations, and technical studies that are not legally binding on their member states, but which generate awareness and engagement in the causes they address. If, on the one hand, international treaties directly regulating emissions from the livestock sector are neither likely nor desirable, then, on the other hand, awareness campaigns crafted by international organizations hold paramount importance. Both national and international campaigns have great potential to be the starting point in changing the eating habits of many people around the world, most of whom currently do not even know that animal-source food has a significant impact on climate change.

“Soft law can offer a general package based on consensus to deal with an environmental problem at a transaction cost much less than that normally required for multilateral agreements. The practical advantages of soft law are its non-legally binding and discretionary character. Soft law facilitates the further development of international environmental law, as

¹⁰⁵There are many examples of international initiatives in various sectors. Although they all aim to reduce emissions, they seldom involve legally binding targets to specific sectors. Examples of initiatives include the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), which is an agreement established by ICAO to offset emissions from international flights; the EU has regulations targeting sectors such as buildings and constructions, transports—including emission standards for cars and vans—and agriculture – encouraging practices that sequester carbon in soils and reduce methane emissions.

¹⁰⁶See BAILEY ET AL., *supra* note 24, at 17.

states may not be ready to enter binding legal agreements on a particular environmental issue. Indeed, the possibility of more detailed strategies being devised, as opposed to the generality of treaties, appears to be greater due to soft law's non-binding nature. Soft law can permit countries to move faster in addressing environmental issues. Its flexibility encourages the quick response to rapid changes in scientific understanding of environmental and developmental issues. A State participating in the creation of international law is faced with many other than strict legal norms and principles.”¹⁰⁷

Domestically, a commitment to awareness campaigns and clarification of the livestock sector's contribution to climate change could be established in future NDCs. Most countries can carry out effective campaigns at the national level. Furthermore, this is not a measure that involves large levels of bureaucracy, such as approving laws and negotiating with sectors with great influence in society.

In addition, concerning nationally determined commitments, the production and consumption of livestock products could be directly or indirectly discouraged. Banning the consumption or production of animal-source food is certainly not a politically viable or effective option. It would probably only generate social unrest and resistance to the diet change that is necessary to reduce GHG emissions. There are, however, other measures that could be adopted.

First, eliminating the large subsidies that the sector receives in the United States, the European Union and other countries is imperative. It is not possible to succeed in the transition to a mostly plant-based diet without stopping stimulating the livestock sector. Second, higher taxes on this type of product could also help reduce consumption. Another initiative that can be effective is to label foods of animal origin, as household appliances are already labeled in many countries, showing the impact of each product on global warming. Finally, modifying national dietary guidelines can also trigger a demand-side response. In the US and most of the European Union, the recommendations continue to primarily focus on animal-based farming products, with limited or secondary references to items like soymilk and vegetarian patties. A study found that meat intake would be much smaller in the US and the EU if the countries' current dietary guidelines were followed, but “agricultural GHG emissions would still exceed the Paris Agreement targets by three hundred percent and one hundred fifty percent in North America and Europe, respectively.”¹⁰⁸ Furthermore:

“Considering the mounting evidence regarding the link between food consumption and environmental damage and the lack of consumer awareness about the impacts of meat production, failing to address this connection in the dietary guidelines is a missed opportunity for consumer education and for guiding health, nutrition, and agricultural policies, as well as the food system in its entirety.”¹⁰⁹

Many other initiatives can be thought of and put into practice to reduce the percentage of animal products in diets. Although no measure alone is likely to produce the necessary reduction effects, every step counts towards raising awareness of the livestock sector's contribution to global warming.

¹⁰⁷ Arif Ahmed & Jahid Mustofa, *Role of Soft Law In Environmental Protection: An Overview*, 4 GLOB. J. POL. & L. RSCH. 1, 9 (2016).

¹⁰⁸ See Vallone & Lambin, *supra* note 22, at 1220.

¹⁰⁹ *Id.*

E. Final Remarks

At various times in history, laws have reflected relationships of power rather than justice. International law itself was created and consolidated based on European reality, and it took a long time before it became something effectively global, capable of reflecting multiple realities. When it comes to climate change, it is unquestionably a global issue that will affect everyone on the planet, regardless of any socio-economic or cultural differences. In this context, international law could be an efficient collective instrument to fight the serious threat of global warming.

Nevertheless, violation of the Paris Agreement is inevitable if the livestock sector continues to be ignored as a major contributor to climate change. Unlike the non-compliance with most existing international conventions, it is not the interests of a few countries that are at stake, but that of humanity. Attaining the emission reduction goals for the sector will pose evident challenges, but it is crucial to recognize the positive aspects and prioritize them as we initiate the process. Unlike other emitting sectors, mitigation does not depend primarily on the creation of new technologies and the challenge of making them accessible to the whole world. Simply raising awareness among the world's population, which is currently virtually blind to either the existence or the real extent of the livestock sector's impact on climate change, is the main initiative to take. International and national instruments already exist and can and should be used to fill the livestock policy vacuum. This would prevent not only non-compliance with the Paris Agreement but above all the triggering of extreme weather events.

Shifts to plant-based diets are a crucial climate change mitigation component and voluntary action is key to success, as legally banning the consumption of certain foods does not seem to be an effective strategy. Although we should expect a considerable level of resistance from society to the reduction in animal-source food consumption, the formulation and implementation of public policies that are essential for the preservation of the planet should not be based on the potential resistance of the sectors affected. The fight against global warming has met with resistance from all sectors from the outset, including powerful ones like the fossil fuel industry. Yet, this has not stopped policymakers and lawmakers from continuing to work to regulate various sectors, stimulating the creation and adoption of cleaner technologies and behaviors. The same must be done in the livestock sector if we want the Earth to continue to serve as a home for humanity.

It is clear that this purposely-forgotten sector is more taboo than the other sectors. Despite this fact, as we strive to combat climate change, we must confront this major source of emissions and incorporate it into our comprehensive efforts to secure a sustainable and habitable future, not only for generations to come, but for our generation.

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